# Sahara Mustard (*Brassica tournefortii*) Research & Control Strategies

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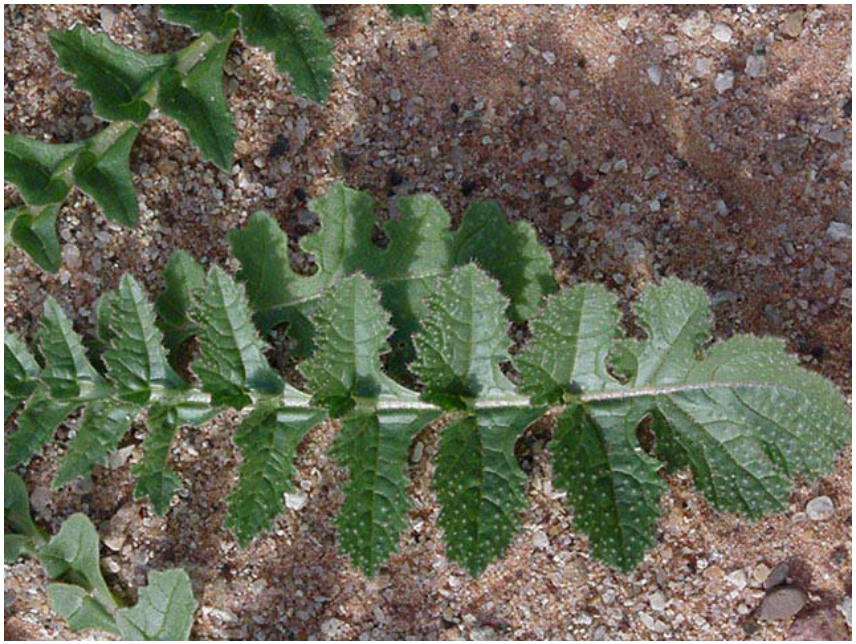


# BRTO ID





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# Mature Plants





# Life Cycle/Biology

- Winter Annual
- Multiple cohorts is common
- Seedbank species
- Rosette/bolt/flower/fruit
- Seed dispersal (sticky gel coat/tumbler)
- Germination and recruitment are Weather/Precipitation dependent
- Presence/density/biomass highly variable
- Understory/interspaces



# Habitats

- Desert Southwest US (Sonoran/Mojave)
- Disturbed sites
- Roadsides
- Dunes
- Sandy and Rocky Soils
- Washes
- Uplands
- Variety of soils



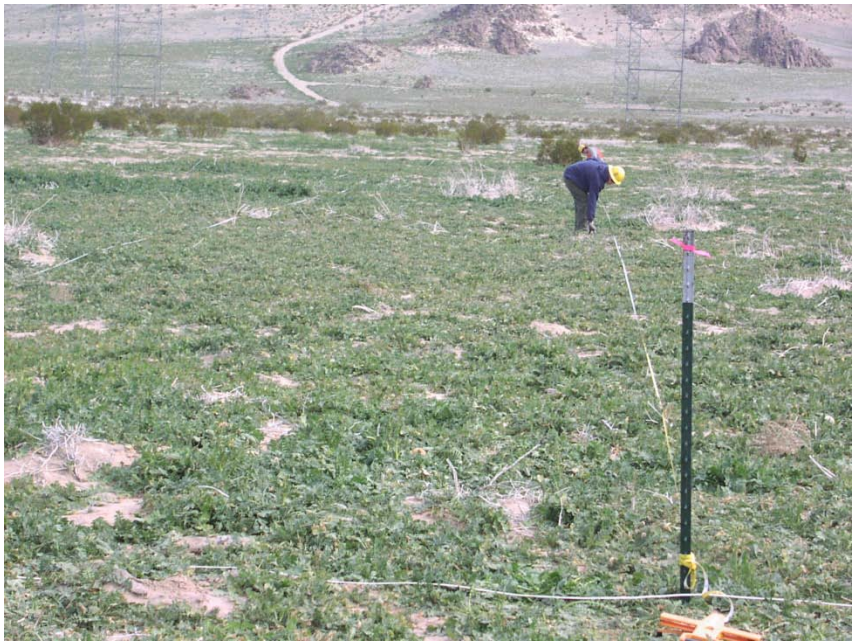
# Ecological Effects

- Compete with native annual forbs
- Perennial shrubs?
- Increase fire fuel/wildfire potential
- Animals direct/indirect
  - Tortoise
  - Lizards
  - Small mammals
  - birds
  - ants



# Local History

- 1920's Coachella Valley
- Slow/obscure increase into 1990's
- 2004/2005 Winter "explosion"
- 2010/2011 Winter (another big year)



# Management Challenges

- Unpredictable
- Widespread/ Landscape scale
- Short response time
- Control methods and effects are not well established/unknown
- Intensive survey, treatments, monitoring and retreatments necessary
- Detection and multiple cohorts

# Control Methodology

- Mechanical
  - Handpull
  - Hoeing
  - Grading
- Chemical
  - Multiple herbicides appear to be effective
- Biological
  - Univ CA/Coop Ext (Chris McDonald)



# Current Methods

- Labor intensive
- Small scale
- Lots of boots on the ground and related soil disturbance



# Hula Hoe Crew





# Bagging during fruiting





# Control Research

- USGS/NPS Research (Brooks,Deuser,Ostoja)
- Evaluating 7 herbicides and handpull/hoe
- 3 Separate Study Sites (CA, NV, AZ)
- Selective application methods
- Measuring:
  - Target effects (3 phenological stages)
  - Non-target effects
  - Seed germination effects



# Block Design





# Center Post Radius

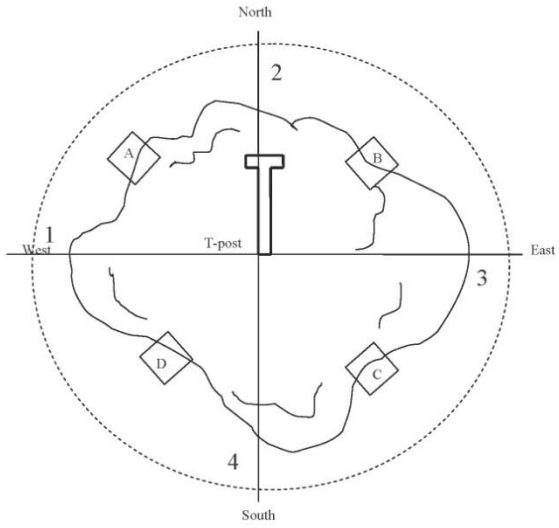
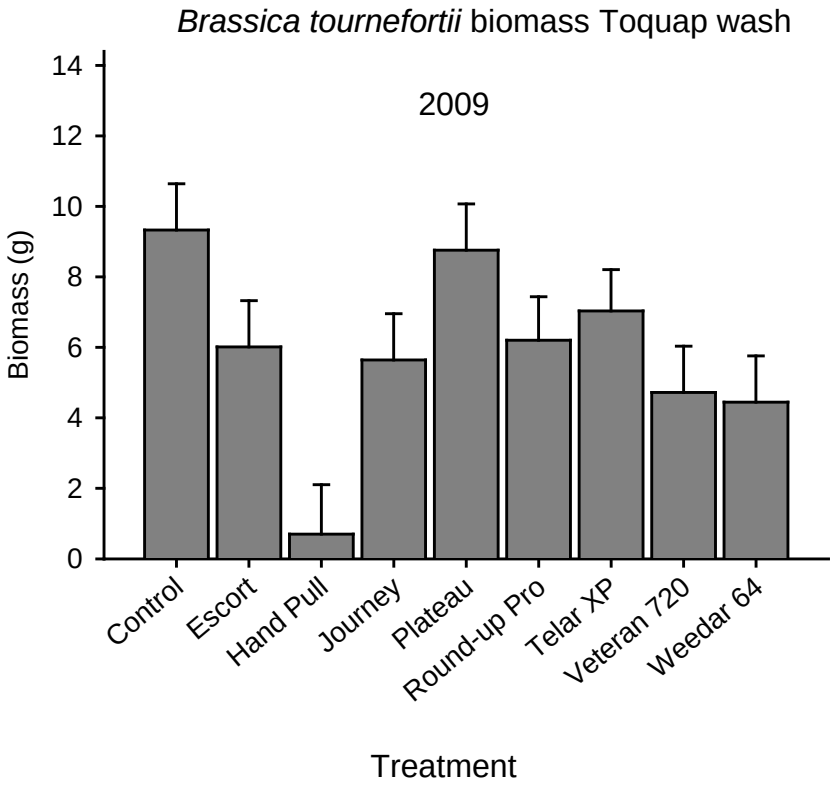


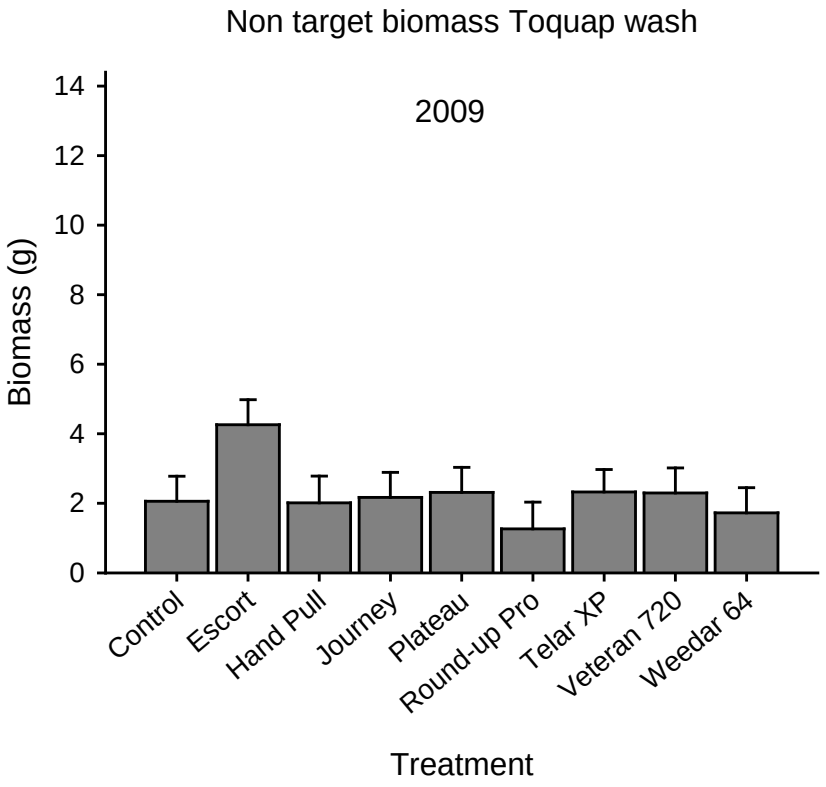

**Fig. 1** Plot layout for Creoste shrub design. Each plot has a T-post near the center of a large single or cluster of 2-3 smaller creosote(*Larrea tridentata*) individuals. Sampling subplots (A-D) located in each quadrat (1-4) at 315 °, 45 °, 135 °, 225 ° from the center of the creosote individual/clump respectively.



Preliminary USGS Data

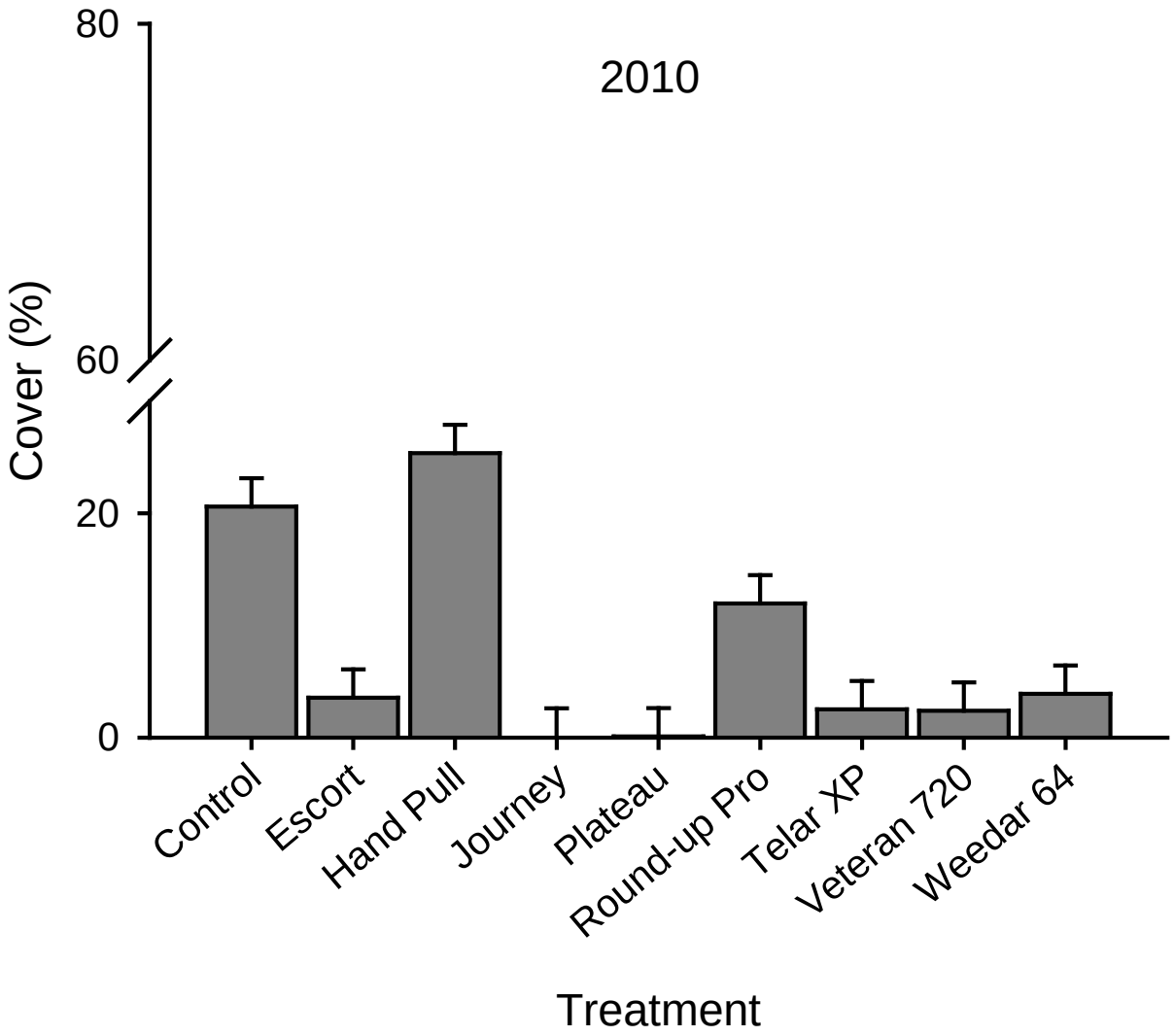
Toquop Wash, Clark County NV  40 Days Post Treatment



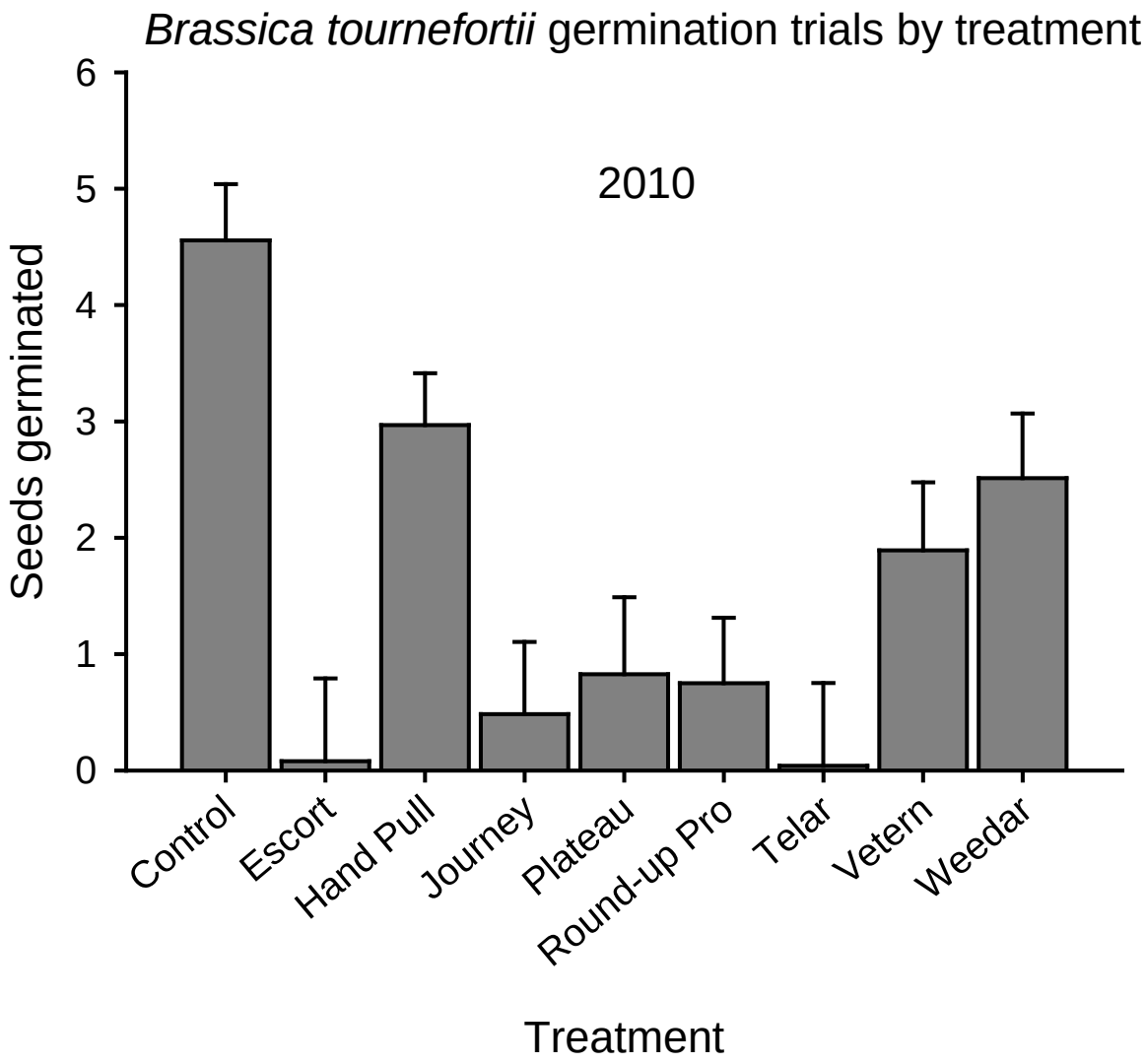



Preliminary USGS Data: 1 Year Post Treatment Data. Clark County, NV

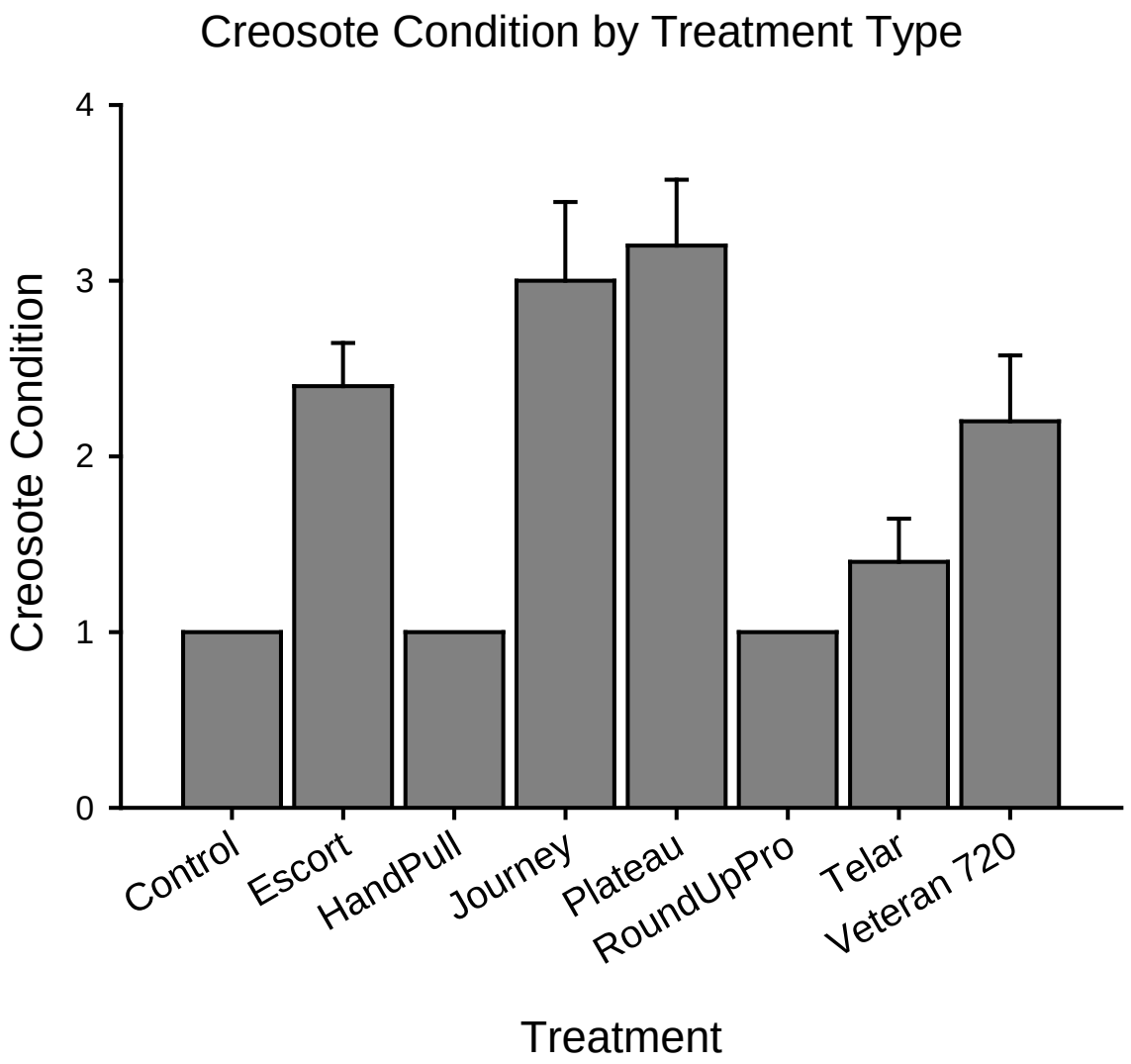
*Brassica tournefortii* percent cover Toquap wash



Preliminary Data: Toquop Wash, Clark County, NV  Seeds collected 40 days post treatment



Preliminary USGS Data: Mohave County, AZ



- Visual estimation of creosote condition at Katharine's Landing brassica treatment site according to the 8 treatments as shown. 1= no damage, 2= mild damage (25% of plant(s) damaged), 3=25-50% plants damaged, 4=50-75 of plant(s) damaged/killed, 5= >75% of plant(s) damaged/killed.

# Study Plot Treatments





# Study Plot Treatments





# Study Plot Treatments





# Study Plot Treatments





# Herbicide Effects





# Epinasty





# Herbicide Mortality





# Largescale Herbicide Application Issues/Concerns/Challenges

- Herbicide application over the canopy of native shrubs?
- Shrub interception
- Incomplete
- Native forbs
- Tortoise



# Current Control Strategies

- Isolated high priority areas (T&E habitats)
- Geographic Exclusion (Death Valley NP)
- Site Exclusion (Kelso Dunes)
- Control/Confinement/Containment: (Joshua Tree NP)

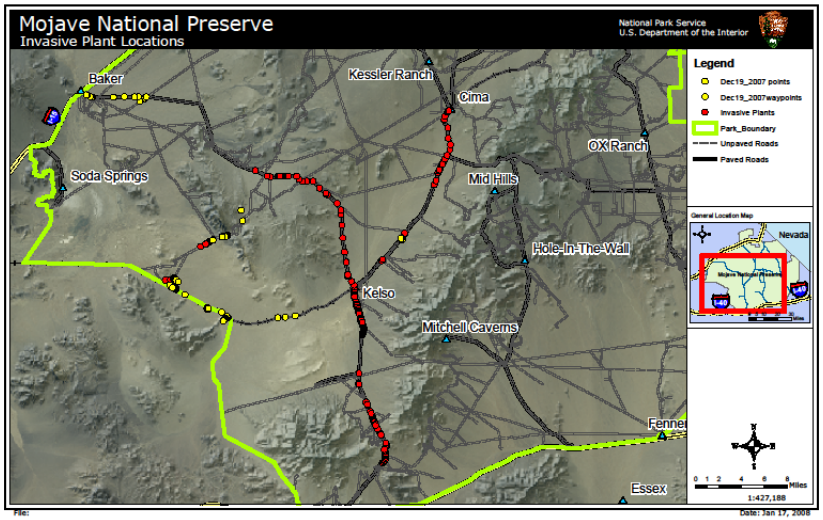
# Lake Mead NRA Strategy






# Mojave NP Strategy



# Joshua Tree NP Strategy





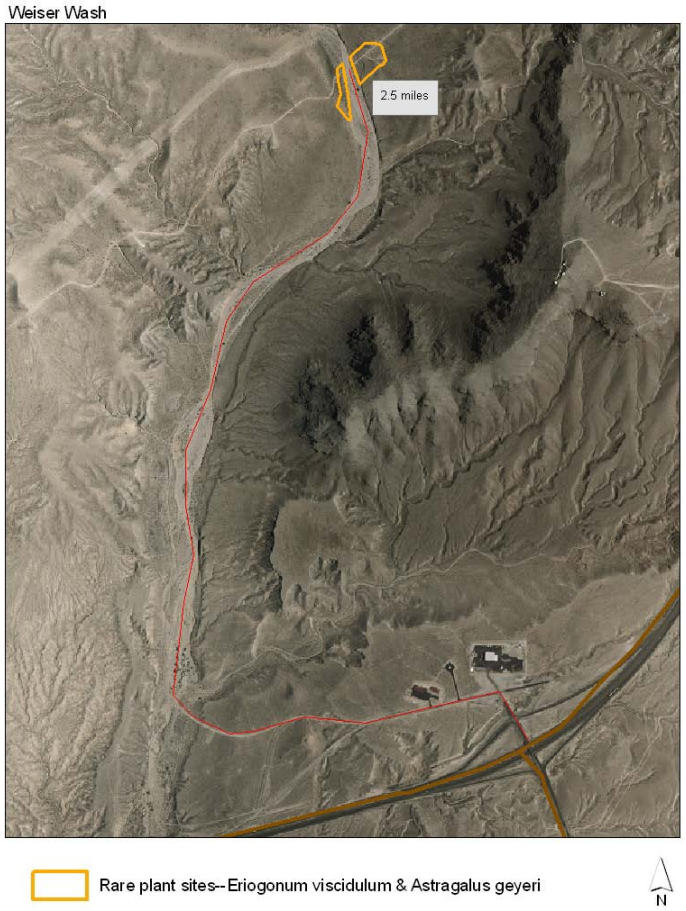


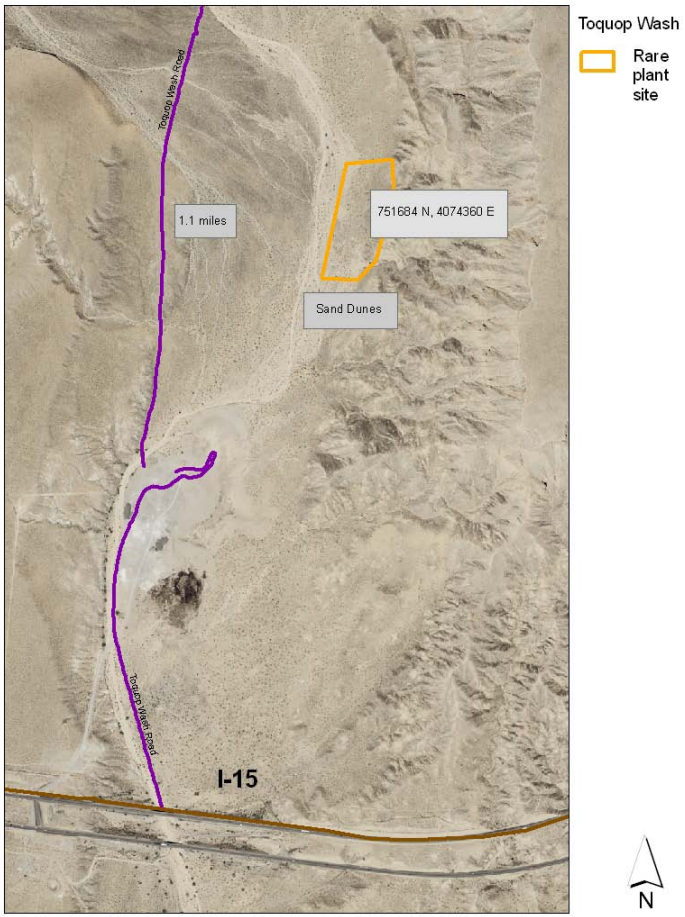

# Death Valley NP Strategy
# EDRR






# Rare Plant/T&E Habitats



# Future…Unknown?



# Discussion



Thank You

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